3.0 SITE DESCRIPTION

3.1 Data Collection/Data Analysis

An inventory of the existing site conditions which will be used in the development of the SWPPP will be required. The information obtained should be both plotted on a map and verbally explained in this portion of the plan. After all data are considered, an assessment of the site potentials and limitations should be made. The site planner or designer should be able to determine those areas which have critical pollutant generation potential. The following are some of the most important considerations in site analysis.

3.1.1 Topography

A small-scale topographic map of the site should be prepared to show the existing contour elevations at intervals of from 0.3 to 1.5 meters (1 to 5 feet) depending upon the slope of the terrain. Existing topographic maps (e.g., U.S. Geological Survey (USGS) or local government topos) can be a good starting point; however, the information should be verified by a field investigation. The primary topographic considerations are slope steepness and slope length. Because of the effect of accumulated runoff, erosion potential is greater on long, steep slopes. When the percent slope has been determined, areas of similar steepness should be outlined. Slope gradients can generally be grouped into three general ranges of soil erodability:

Slope	Erosion Hazard
0-7%	Low erosion hazard
7-15%	Moderate erosion hazard
>15%	High erosion hazard

Within these slope gradient ranges, the erosion hazard becomes greater as the slope length increases. Therefore, in determining potential critical areas, the site planner should be aware

of excessively long slopes. As a general rule, the erosion hazard will become critical if the slope exceeds the following criteria:

Slope	Critical Length, meters (feet)
0-7%	91 (300)
7-15%	46 (150)
>15%	23 (75)

3.1.2 Drainage Patterns

All existing drainage swales and patterns on the site should be located and clearly marked on the topographic map. Perennial or intermittent streams, as well as wetland areas, should also be shown on the map. The existing drainage patterns, which consist of overland flow, swales and depressions, and natural watercourses, should be identified in order to plan around critical areas where water will concentrate. Where possible, natural drainageways should be used to convey runoff over and off the site to avoid the expense and problems of constructing an artificial drainage system. Man-made ditches and waterways can become part of the erosion problem if they are not properly designed and constructed. Care should also be taken to be sure that the increased runoff from the site will not erode or flood the existing natural drainage system. Possible sites for storm water detention should be located at this time.

3.1.3 Soils

Major soil type(s) on the site should be shown on the topographic map. Soils information can be obtained from a soil survey if one has been published for the county in which the project is proposed. If a soil survey is not available, a request can be made to a district Soil Conservation Service (SCS) office, a county extension service, or a state or Federal Department of Agriculture. Commercial soils evaluations may also be available. Soils information should be plotted directly onto the map or an overlay of the same scale for ease of interpretation. Such soils properties as natural drainage, depth to bedrock, depth to

seasonal high water table, permeability, shrink-swell potential, texture, and erodibility should exert a strong influence on land development decisions.

3.1.4 Ground Cover

The existing vegetation such as tree clusters, grassy areas, and unique vegetation should be shown on the map. In addition, existing denuded or exposed soil areas should be indicated. Ground cover is the most important factor in terms of preventing erosion. Any existing vegetation which can be saved will help prevent erosion. Trees and other vegetation protect the soil, as well as beautify the site after construction. If the existing vegetation cannot be saved, the planner should consider staging construction and using temporary seeding or temporary mulching. Staging of construction involves stabilizing one part of the site before disturbing another. In this way, the entire site is not disturbed at one time. Temporary seeding and mulching involve seeding or mulching areas which would otherwise lie exposed for long periods of time. Thus, the time of exposure is shortened and the erosion hazard is reduced.

3.1.5 Adjacent Areas

Areas adjacent to the site should be delineated on the topographic map. Features such as streams, roads, houses or other buildings, and wooded or wetland areas should be shown. Streams which will receive runoff from the site should be surveyed to determine their carrying capacity. The analysis of adjacent properties should focus on areas downslope from the construction activity. Of major concern are watercourses which will receive direct runoff from the site. The potential for sediment pollution of these watercourses should be considered, as well as the potential for downstream channel erosion due to increased volume, velocity, and peak flow rate of storm water runoff from the site. The potential for sediment deposition on adjacent properties due to sheet and rill erosion should also be analyzed so that appropriate sediment-trapping measures can be planned and installed prior to any land-disturbing activity. Drainage from large areas upstream from proposed active construction sites should be

diverted around the sites wherever possible. Whenever possible, diversionary drainage channels should be established and stabilized before active site disturbance activities begin.

3.1.6 State/Local Requirements

Federal, state, and local agencies that undertake land-disturbing activities are generally regulated by the same authorities that regulate private land-disturbing activities. Readers are encouraged to contact local jurisdictional agencies such as the County Engineer regarding permits, fees, and plan submission, as well as any other requirements. Facilities which are already operating under approved state or local sediment and erosion plans, grading plans, or storm water management plans are required to submit copies of the NOI to the agency approving such plans in accordance with Part II.A of the general permit (or sooner where required by state or local rules), in addition to submitting the NOI to EPA or the NPDES-delegated authority in accordance with paragraph II.C of the general permit.

3.2 Site Plan Development

The permits issued by NPDES-delegated states will specify deadlines for plan development and implementation. The sequence of events, assumably, will be that the SWPPP's will be completed and implemented at the time the project breaks ground and revised, if necessary, as construction proceeds. The SWPPP should be in place before project initiation because construction operations pose environmental risks as soon as activity begins. The initial clearing and grubbing operation may contribute a significant amount of pollutants to storm water runoff. The reader is urged to read the applicable permit carefully to determine what dates and deadlines apply to the project.

The planning for pollution prevention measures should be done concurrently with the development of the construction plans. The best SWPPP's are developed at the same time as the design of the site plan. However, if the site design has already been completed, it is not necessary to start the process all over again. Much of the information needed for the

SWPPP should already be included in the design documents. An SWPPP can be prepared for most construction projects by using information from the existing design, and modifying the design to accommodate the controls.

After analyzing the data and determining the site limitations, the planner can develop a site plan. When designing the site plan, the planner should keep in mind that increases in runoff may require structural runoff control measures or channel improvements. Both items are expensive, and even more so when the site plan has to be redesigned to accommodate the runoff control measures. Therefore, the planner should minimize the increase in runoff or include runoff control measures in the initial design. The following are some issues to consider when developing the site plan.

3.2.1 Controlled Grading

The development of an area should be tailored to the existing site conditions. This tailoring will avoid unnecessary land disturbance, thereby minimizing the erosion hazards and costs. Excessive cutting and filling should be avoided, if possible. Slopes should be at a maximum of 2:1 or less, depending on soil type to provide for final stabilization.

3.2.2 Critical Areas

Land disturbance in critically erodible areas may necessitate the installation of more costly control measures. See criteria for critical areas in Section 3.1.1.

3.2.3 Cluster Development

Whenever possible, developments in which facilities are clustered together, or performance of construction is in a sequence of clusters, is a desired approach. The cluster concept minimizes the amount of disturbed area, concentrates utility lines and connections in one

area, and provides more open natural space. The cluster concept not only lessens the erodible area, but it generally reduces runoff and generally reduces development costs.

3.2.4 Minimization of Imperviousness

Keep paved areas such as parking lots and roads to a minimum. This pavement minimization goes hand-in-hand with cluster development in eliminating the need for duplicating parking areas and access roads. The more land that is kept in vegetative cover, the more water will infiltrate, thus reducing runoff and erosion.

3.2.5 Utilization of Natural Drainage

If the natural drainage system of a site has been determined that it can properly handle runoff generated during and after construction activities without resulting in bank and bed erosion, the natural system should be preserved instead of being replaced with storm sewers or concrete channels.

3.3 Storm Water Runoff Calculations

The problems associated with storm water runoff in rapidly urbanizing watersheds have become well known. These problems relate both to the quantity and quality of storm water runoff. Major problems include increased flooding magnitude and frequency, accelerated stream channel erosion, and water quality degradation. The basic underlying cause of these problems is not difficult to understand. The hydrologic systems which have reached a natural equilibrium over centuries simply cannot adjust to the sudden impact of urban development. Flooding occurs because the increased volume and peak rate of runoff exceed the natural carrying capacity of the streams. Stream channel erosion accelerates due to suddenly increased flow velocities and flooding frequency. The water quality itself is degraded by sedimentation and numerous other pollutants associated with urbanization that become available to be washed off the land surface and into water resources.

Studies have shown that most natural stream channels are formed with a bankfull capacity to pass runoff from a storm with a 1.5- to 2-year recurrence interval. As upstream development occurs, the volume and velocity of flow from these relatively frequent storms increase. Consequently, even smaller storms with less than 1-year recurrence intervals begin to cause streams to flow full or flood. According to one study, stream channels are subject to a three- to five-fold increase in the frequency of bankfull flows in a typical urbanizing watershed. This increase in the flooding frequency places a stress on the channel to adjust its shape and alignment to accommodate the increased flow. Unfortunately, this adjustment takes place in a very short time in geologic terms, and the transition is usually not a smooth one. Meandering stream channels, which were once parabolic in shape and covered with vegetation, typically become straight, wide rectangular channels with barren vertical banks. This process of channel erosion often causes significant property damage, and the resulting sediment is transported downstream, further contributing to channel degradation.

One strategy for dealing with this problem is to increase the carrying capacity and stability of affected streams through channel modifications. This strategy may be employed most effectively on man-made channels or small, intermittent streams. Significant modifications to natural, continuous flowing streams, however, can be the subject of intense local controversy.

Wherever modifications to natural flowing streams are being considered, extreme care must be taken to weigh the benefits of such modifications against the cost and the concerns of the local citizens. Where channel modifications are necessary, an attempt should be made to incorporate conservation practices that will minimize adverse impacts to fish, wildlife, and the aesthetic quality of the stream. In general, erosion and sedimentation controls, and the overall SWPPP, are focused on preserving existing streamflow quantity and quality, whenever possible.

The following storm water runoff requirements were developed to provide guidance for designers and planners in the absence of state regulatory guidance or local storm water management programs. These criteria are considered "rule of thumb" minimums:

- Increased volumes of sheet flow that may cause erosion or sedimentation on adjacent property must be diverted to a stable outlet, *adequate* channel, or detention facility.

- Concentrated storm water runoff leaving a development site must be discharged directly into an *adequate* natural or man-made receiving channel, pipe, or storm sewer system.

- An adequate channel is defined as "a watercourse that will convey a chosen frequency storm event without overtopping its banks or causing erosive damage to the bed, banks, and overbank sections of the watercourse."

- A receiving channel may be considered *adequate* if the total drainage area to the point of analysis in the channel is 100 times greater than the contributing drainage area of the project site.

- For natural channels, the 2-year frequency storm is used to verify that storm water will not overtop the channel banks nor cause erosion of the channel bed or banks.

- For man-made channels, the 10-year frequency storm is used to verify that storm water will not overtop the channel banks and the 2-year storm is used to demonstrate that storm water will not cause erosion of the channel bed or banks.

- For pipes and storm sewer systems, the 10-year frequency storm is used to verify that storm water will be contained within the pipe or storm sewer.

If existing natural receiving channels or previously constructed man-made channels or pipes are not *adequate*, the applicant must choose one of the following options.

- Improve the channels to a condition where the 10-year frequency storm will not overtop the channel banks and the 2-year frequency storm will not cause erosion to the channel bed or banks. The applicant must provide evidence of permission to make the improvements.

- Improve the pipe or storm sewer system to a condition where the 10-year frequency storm is contained within the appurtenances. The applicant must provide evidence of permission to make the improvements.

- Develop a site design such that when runoff discharges directly to a natural channel, the postconstruction peak flow for the 2-year storm will be no greater

than the predevelopment peak flow. When discharge is directed to a man-made channel, the postconstruction peak flow for the 10-year storm will be no greater than the predevelopment peak flow.

- Provide a combination of channel improvements, storm water detention, or other measures satisfactory to the plan-approving authority to prevent downstream erosion.

If the applicant chooses an option that includes storm water detention, the applicant must obtain approval from the locality for a plan for maintenance of the detention facility. The plan must establish the maintenance requirements for the facility and identify the person or entity responsible for performing the maintenance.

Each receiving channel must be tested for *adequacy*. A channel is considered adequate if any of the following conditions can be met:

- The bankfull capacity of the *natural* receiving channel is sufficient to pass the postdevelopment peak flow from the 2-year frequency storm *and* the channel velocity (2-year frequency storm) does not exceed the permissible (non-erodible) velocity of the channel lining.
- The bankfull capacity of the *man-made* receiving channel is sufficient to pass the postdevelopment peak flow from the 10-year frequency storm *and* the channel velocity (2-year frequency storm) does not exceed the permissible (nonerodible) velocity of the channel lining.
- The storm sewer conduits (pipes) must pass the 10-year frequency storm.
- The contributing drainage area of the development site is less than 1 percent of the total drainage area to the point of consideration in the channel.
- There is no increase in the peak runoff rate for the 2-year frequency storm (for natural receiving channels) or the 10-year frequency storm (for man-made channels) at the point of discharge after development.

If the receiving channel is found to be *inadequate*, the applicant should incorporate measures to either improve the receiving channel to an adequate condition, or detain runoff on the site so that the postdevelopment peak runoff rate for the 2-year storm will not exceed the

predevelopment peak rate. The plan-approving authority may also approve a combination of channel improvements and detention or other measures deemed satisfactory to protect the channel

- If a channel-improvement option is chosen, the applicant must obtain necessary easements and comply with applicable regulations regarding channel modifications. Channel improvements must extend downstream until an adequate channel section is reached or until a point is reached where the total drainage area is at least 100 times greater than the drainage area of the development site.

- If a storm water detention option is chosen, the applicant must submit a plan for the continued maintenance requirements of the structure and designate someone, who has consented to be responsible, to carry out the maintenance. The local government may choose to accept the maintenance responsibility for detention structures. However, where the local government does not accept responsibility, the responsibility must be borne by the COE, other Federal agency, landowner, a homeowners' association, or other legal entity.

3.3.1 Calculation Method

Selection of the appropriate method of calculating runoff should be based upon the size of the drainage area and the output information required. Table 3-1 lists the acceptable calculation methods for different drainage areas and output requirements. The plan-approving authority may require or accept other calculation methods deemed more appropriate for local conditions.

3.4 Erosion and Sediment Control Plan

Simply stated, an erosion and sediment (E&S) control plan is a document that describes the measures to be taken to control the potential for erosion and sedimentation on a construction project.

Table 3-1
Runoff Calculation Methods: Selection Criteria

Calculation Methods*

1. Rational Method
2. Peak Discharge Method
3. Tabular Method (TR-55)
4. Unit Hydrograph Method

Output Requirements	Drainage Area	Appropriate Calculation Methods
Peak discharge only	Up to 81 hectares (200 acres) Up to 809 hectares (2,000 acres) Up to 52 sq km (20 square miles)	1,2,3,4 2,3,4 3,4
Peak discharge and total runoff volume	Up to 809 hectares (2,000 acres) Up to 52 sq km (20 square miles)	2,3,4 3,4
Runoff hydrograph	Up to 52 sq km (20 square miles)	3,4

* There are numerous publications that describe the four methods listed in Table 3-1. A comprehensive discussion of each of these methods is beyond the scope of this pamphlet; readers are encouraged to consult other sources. One such source is McCuen, Richard H., *Hydrologic Analysis and Design*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1989.

The E&S control plan should be an independent entity from the construction drawings of a project. While it is a good idea to include E&S control standards and specifications in contract documents, the E&S control plan itself should contain measures to ensure that the controls are installed, inspected, and maintained properly.

The plan narrative should explain the E&S control decisions made for a particular project and the justification for those decisions. The narrative is especially important to the plan-approving authority because it contains concise information concerning existing site conditions, construction schedules, and other pertinent items which are not apparent in a typical site plan. Since a plan reviewer cannot always visit the site or discuss the project at length with the site planner, it is essential that the necessary information be provided for the plan review.

The narrative is also important to the construction superintendent and inspector who are responsible for seeing that the plan is implemented properly. The narrative provides them

with a single report that describes where and when the various erosion and sediment control practices should be installed.

An E&S control plan must contain sufficient information to satisfy the plan-approving authority that the problems of erosion and sedimentation have been adequately addressed for a proposed project. The length and complexity of the plan should be commensurate with the size of the project, the severity of site conditions, and the potential for offsite damage. Obviously, a plan for constructing a small structure on smaller area does not need to be as complex as a plan for a large multistructure project involving many acres. Also, plans for projects undertaken on flat terrain will generally be less complicated than plans for projects constructed on steep slopes where erosion potential is greater. The greatest level of planning and detail should be evident on plans for projects which are directly adjacent to flowing streams, dense population centers, or high value properties where damage may be particularly costly or detrimental to the environment. As a guide to E&S plan content, the site planners should use the checklists located on the following pages.

CHECKLIST

FOR EROSION AND SEDIMENT CONTROL PLANS

NARRATIVE

_____ Project description - Briefly describe the nature and purpose of the land-disturbing activity and the area (hectares or acres) to be disturbed.

_____ Existing site conditions - Describe the existing topography, vegetation, ground cover, and drainage.

_____ Adjacent areas - Describe neighboring areas such as streams, lakes, residential areas, and roads which might be affected by the land disturbance.

_____ Offsite areas - Describe any offsite land-disturbing activities that will occur (including borrow sites, waste or surplus areas, etc.). Will any other areas be disturbed?

_____ Soils - Describe the soils on the site giving such information as soil name, mapping unit, erodibility, permeability, depth, texture, and soil structure.

_____ Critical areas - Describe areas on the site which have potentially serious erosion problems (e.g., steep slopes, channels, and wet weather/underground springs).

_____ Erosion and sediment control measures - Describe methods which will be used to control erosion and sedimentation on the site.

_____ Permanent stabilization - Provide a brief description, including specifications, of how the site will be established after construction is completed.

_____ Storm water runoff considerations - Will the development site cause an increase in peak runoff rates? Will the increase in runoff cause flooding or channel degradation downstream? Describe the strategy to control storm water runoff.

_____ Calculations - Present detailed calculations for the design of temporary sediment basins, permanent storm water detention basins, diversions, channels, etc. Include calculations for pre- and postdevelopment runoff.

CHECKLIST
FOR EROSION AND SEDIMENT CONTROL PLANS
(continued)

SITE PLAN

_____ Vicinity map - Provide a small map locating the site in relation to the surrounding area. Include any landmarks which might assist in locating the site.

_____ North arrow - Indicate the direction of north in relation to the site.

_____ Limits of clearing and grading - Show areas which are to be cleared and graded.

_____ Existing contours - Show the existing contours of the site.

_____ Final contours - Indicate changes to the existing contours, including final drainage patterns.

_____ Existing vegetation - Show the existing tree lines, grassed areas, or unique vegetation.

_____ Soils - Show the boundaries of different soil types.

_____ Existing drainage patterns - Indicate the dividing lines and the direction of flow for the different drainage areas. Include the size (area in hectares or acres) of each drainage area.

_____ Critical erosion areas - Show areas with potentially serious erosion problems.

_____ Site development - Show all improvements such as buildings, parking lots, access roads, and utility construction.

_____ Location of practices - Show the locations of erosion and sediment controls and storm water management practices used on the site.

_____ Offsite areas - Identify any offsite land-disturbing activities (e.g., borrow sites and waste areas). Show location of erosion controls. (Is there sufficient information to assure adequate protection and stabilization?)

_____ Detail drawings - Note that any structural practices used that are not referenced to an erosion and sedimentation handbook or local handbooks should be explained and illustrated with detail drawings.

_____ Maintenance - Furnish a schedule of regular inspections and repair of erosion and sediment control structures.

Erosion and sediment control planning should be an integral part of the site planning process, not an afterthought. The potential for soil erosion should be a significant consideration when deciding upon the layout of buildings, parking lots, roads, and other facilities. Costly erosion and sediment control measures can be minimized if the site design can be adapted to existing site conditions and if good conservation principles are used. Note that sedimentation ponds, often used for erosion and sedimentation control during construction, can be adapted to site amenities, if properly preplanned. The owner or lessee of the land being developed has the responsibility for plan preparation and submission. The owner or lessee may designate someone (e.g., an engineer, architect, or contractor) to prepare the plan, but the owner or lessee retains the ultimate responsibility.

3.4.1 Technical Assistance

There are a number of possible sources of erosion and sediment control planning assistance within most states.

1. Soil and Water Conservation Districts: These districts usually have elected representatives (directors) from different localities throughout the state. One of the primary functions of these districts is to provide assistance to landowners for soil conservation planning and implementation. Requests for assistance in preparing an erosion and sediment control plan for a construction site can be made through the local district.

2. Natural Resource Conservation Service (NRCS): The NRCS is formerly the Soil Conservation Service. The NRCS provides technical assistance on conservation planning through local soil and water conservation districts to landowners throughout the country. In addition, the NRCS, in conjunction with many state universities, is involved with soil surveys throughout many states. Many localities have existing published soil surveys. Requests can be made through an NRCS field office or a university soil survey field office for a soil survey on a specific site. Requests will generally be acted upon according to local priorities.

3. State Cooperative Extension Service: The Extension Service can provide valuable information on site planning and establishment of lawns and plant materials. The extension service has a number of useful publications and in

addition will have soil samples analyzed upon request to determine fertilization and liming needs for establishing vegetation on a particular site.

4. Local Government Offices: Many localities have a separate department that is responsible for administering the local erosion and sediment control program. Local staff can be a valuable resource for technical assistance and information concerning local requirements. Often, the County Engineer's office is a good place to start in the development of the basic information needed to prepare an SWPPP.

3.4.2 Limits of Disturbance

After the layout of the site has been determined, a plan to control erosion and sedimentation from the disturbed areas must be formulated. Decision concerning which areas must be disturbed in order to accommodate the proposed construction must be made. Special attention is directed to critical areas that may be disturbed.

3.4.3 Drainage Map

The site should be divided into drainage areas. Potential runoff flow paths over the developed site should be determined. Considerations concerning how erosion and sedimentation can be controlled in each small drainage area should be made before considering the entire site. The guiding principle is that it is easier to control erosion than to contend with sediment after it has been carried downstream.

3.4.4 Erosion and Sediment Control Best Management Practices

Erosion and sediment control practices can be divided into three broad categories: vegetative controls, structural controls, and management measures. Each of these categories have temporary and permanent control measures to be considered. Vegetative and structural practices should be selected and designed in accordance with Federal, state, and/or local specifications if they exist. In lieu of any local standards and specifications, the best

management practices described in Appendix C should be utilized. The Best Management Practices (BMP) listed in Appendix C were obtained from the following sources:

(1) Virginia Department of Conservation and Recreation Division of Soil and Water Conservation's *Virginia Erosion and Sediment Control Handbook*, 1992 Third Edition.

(2) Washington State Department of Ecology's "Stormwater Management Manual For Puget Sound Basin," 1992.

(3) United States Department of Agriculture, Soil Conservation Service's Guidelines for the Control of Erosion and Sediment in Urbanizing Areas Within Mississippi, 1975.

(4) United States Environmental Protection Agency's *Summary Guidance For Storm Water Management For Construction Activities - Developing Pollution Prevention Plans and Best Management Practices,* 1992.

In the event of overlap or conflicting specifications (i.e., riprap gradations or filter fabric design specs), the appropriate geographic district should be contacted to resolve any discrepancy. The following are summary overviews of the erosion and sediment control practices recommended for use. Management measures are construction management techniques which, if properly utilized, can minimize the need for physical controls and possibly reduce costs.

3.4.4.1 Vegetative Controls

Planners should keep in mind that the first line of defense is to prevent erosion. Erosion prevention is accomplished by protecting the soil surface from raindrop impact and overland flow of runoff. The best way to protect the soil surface is to preserve the existing ground cover. Where land disturbance is necessary, temporary seeding or mulching should be used on areas which will be exposed for long periods of time. Erosion and sediment control plans must contain provisions for permanent stabilization of denuded areas. Selection of permanent vegetation should include the following considerations:

- Applicability to site conditions.
- Establishment requirements.
- Maintenance requirements.
- Aesthetics.

The vegetative BMP's in Appendix C are numbered according to the following categories of use:

BMP No.	Description
29-30	Site Preparation for Vegetation Establishment
31-34	Grass Establishment
35-36	Mulches
37-38	Other Vegetative Controls
39	Dust Control

The local agricultural extension service should be consulted concerning suitable vegetation and vegetative treatments.

3.4.4.2 Structural Controls

Structural control practices are generally more costly than vegetative controls. However, they are usually necessary since not all disturbed areas can be protected with vegetation. Structural controls are often used as a second or third line of defense to capture sediment before it leaves the site. It is very important that structural practices be selected, designed, and constructed according to BMP's of which many are listed in Appendix C. Improper use or inadequate installation can result in failure of the control and subsequent release of any trapped sediment.

The structural BMP's in Appendix C are numbered according to the following categories of use:

BMP No.	Description
1	Safety
2-3	Road Stabilization
4-8	Sediment Barriers
9-12	Dikes and Diversions
13-14	Sediment Traps and Basins
15-16	Flumes
17-21	Waterway and Outlet Protection
22-27	Stream Protection
28	Subsurface Drainage

3.4.4.3 Management Measures

Good construction management is as important as structural and vegetative practices for erosion and sediment control, and there is generally little or no cost involved. Management measures must be properly addressed in the SWPPP to identify responsible parties and duties required for implementing these measures. Following are some management considerations which can be employed:

- Include erosion and sediment control as an agenda item for the pre-construction meeting.
- Sequence construction so that no area remains exposed for unnecessarily long periods of time.
  - Work in a logical sequence, especially for drainage items.
  - Anticipate the site conditions that will exist as the construction progresses toward the final product.
  - Have the materials on-hand to complete the work without delay.
  - Apply temporary stabilization immediately after grading.
- On large projects, stage the construction, if possible, so that one area can be stabilized before another is disturbed, whenever possible.

- Consider the time of year.
  - Be prepared for sudden thunderstorms.
  - Install erosion and sediment controls immediately.
  - Use straw mulch for grass seed, especially during poor germination periods.
- Physically mark off limits of disturbance on the site with tape, signs, or other methods, so that workers can see areas to be protected.
- Develop and carry out a regular maintenance schedule for erosion and sediment control practices.
- Designate one individual (preferably the job superintendent or Quality Control Chief) responsible for implementing the erosion and sediment control plan. Make sure that all workers understand the major provisions of the erosion and sediment control plan. Establish reporting procedures for problems identified by workers.